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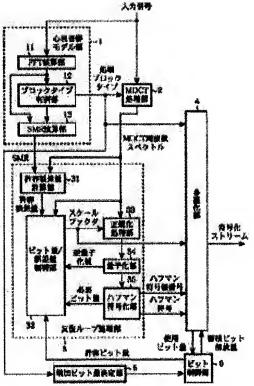
(54) ACOUSTIC SIGNAL ENCODING APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To suppress the quantization distortion and maintain the bit rate at an average value.
SOLUTION: When a process block type from a block type discriminating part 12 is a short type, an increase bit quantity determining part 5 determines the increase bit quantity used for quantization. A bit controlling part 6 adds an average bit allocation quantity to the determined increase bit quantity, outputs an allowable bit quantity usable for quantization to a bit quantity/error quantity controlling part 32, finds the difference between a used bit quantity when a previous encoded frame obtained from a multiplexing part 4 is processed and the average bit allocation quantity, adds the difference to an accumulated bit quantity and outputs an accumulated bit release quantity to the multiplexing part 4 when an added value exceeds a predetermined upper limit.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]In audible signal coding equipment which codes an audible signal, generates an encoded bit sequence, and is sent out to a transmission line, When a processing block type of a coding frame in the above-mentioned audible signal is a short type which raises time resolution, Audible signal coding equipment adding an average bit allotment computed from the bit rate which determines increase bit quantity for using it for quantization, and is specified as determined increase bit quantity in the case of coding, and calculating allowable bit quantity which can be used for quantization.
[Claim 2]The audible signal coding equipment according to claim 1 determining increase bit quantity to a coding frame of a predetermined number after a coding frame whose processing block type is a short type.
[Claim 3]The audible signal coding equipment according to claim 1 or 2 making increase bit quantity into predetermined bit quantity defined beforehand.
[Claim 4]The audible signal coding equipment according to claim 2 decreasing increase bit quantity to determine gradually to a coding frame of a predetermined number after a coding frame whose processing block type is a short type.
[Claim 5]A processing block type makes increase bit quantity of a coding frame which is a short type predetermined bit quantity defined beforehand, The audible signal coding equipment according to claim 2 decreasing increase bit quantity to determine gradually to a coding frame of predetermined numbers other than a short type after a coding frame whose above-mentioned processing block type is a short type.
[Claim 6]The audible signal coding equipment according to claim 1 characterized by adjusting increase bit quantity according to energy of an audible signal in a coding frame.
[Claim 7]The audible signal coding equipment according to claim 6 adjusting increase bit quantity to a coding frame of a predetermined number after a coding frame whose processing block type is a short type.
[Claim 8]An average bit allotment computed from the bit rate specified in the case of coding, The audible signal coding equipment according to claim 1 accumulating difference with operating bit quantity which is needed at the time of processing of a coding frame, releasing predetermined bit quantity according to bit quantity accumulated at the time of processing of subsequent coding frames, and generating an encoded bit sequence.
[Claim 9]The audible signal coding equipment according to claim 8 with which a processing block type is characterized by releasing bit quantity accumulated to a coding frame which is except a short type.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention codes the audible signal of a broadband and relates to the audible signal coding equipment which makes variable encoded bit queue length generated by coding processing, and carries out multiplex transmission to a transmission line.
[0002]
[Description of the Prior Art]Drawing 15 is a block diagram showing the composition of the conventional audible signal coding equipment of the MPEG-2AAC system shown in 13818 to ISO/IEC7 standard. In a figure, 1 generates FFT (Fast Fourier Transform: Fast Fourier Transform) frequency spectrum from an input signal, and computes a masking threshold, It is a psychoacoustic model part which distinguishes the processing block type of the signal made into an analysis object, and computes the signal versus mask ratio SMR (Signal MaskRatio) with FFT frequency spectrum and a masking threshold. In a certain frequency band, since the mask of the masking threshold is carried out [sound] by the signal component of the characteristic of human being's ear, or other frequency bands, it shows the minimum level value of the signal it becomes impossible to perceive with human being's ear.
[0003]In drawing 15, 2 is a MDCT treating part which carries out the frequency orthogonal transformation of the input signal based on the processing block type from the psychoacoustic model part 1, and generates MDCT (Modified Discrete Cosine Transform: modification discrete cosine transform) frequency spectrum.
[0004]In drawing 15, 3 calculates the amount of permissible errors of quantization permissible with the MDCT frequency spectrum from the signal versus mask ratio SMR and the MDCT treating part 2 from the psychoacoustic model part 1, The processing which normalizes the MDCT frequency spectrum from the MDCT treating part 2, is quantized, and carries out Huffman encoding, The quantization error quantity by the quantized MDCT frequency spectrum is less than the amount of permissible errors, And it carries out repeatedly until the required bit quantity which is needed for quantization is less than allowable bit quantity, It is a repetitive loop processing part which outputs the Huffman coding book number selected on the occasion of the MDCT frequency spectrum and Huffman encoding by which determined the scale factor which is a normalization coefficient and Huffman encoding was carried out to the determined scale factor.
[0005]The MDCT frequency spectrum, Huffman coding book number, and scale factor to which Huffman encoding of 4 was carried out from the repetitive loop processing part 3 in drawing 15, It is a multiplexing part which carries out multiplexing processing of the processing block type from the psychoacoustic model part 1 with supplementary information, such as a header, generates an encoded bit sequence, and sends out encoded bit streams.
[0006]In the psychoacoustic model part 1 of drawing 15, the FFT operation part in which 11 generates FFT frequency spectrum from an input signal, and 12 compute a masking threshold from frequency spectrum, The block type discrimination section which distinguishes the processing block type of the signal made into

an analysis object, and 13 are SMR operation part which computes the signal versus mask ratio SMR with the masking threshold from the frequency spectrum and the block type discrimination section 12 from FFT operation part 11.

[0007]It is the amount calculation part of permissible errors which calculates the amount of permissible errors of the quantization which 31 can permit with the MDCT frequency spectrum from the signal versus mask ratio SMR and the MDCT treating part 2 from the psychoacoustic model part 1 in the repetitive loop processing part 3 of drawing 15, 32 with the inverse quantization value of the MDCT frequency spectrum from the MDCT treating part 2, and the MDCT frequency spectrum which was obtained from the below-mentioned quantizing part 34 and by which inverse quantization was quantized and carried out. As quantization error quantity is calculated, and quantization error quantity is less than the amount of permissible errors computed by the amount calculation part 31 of permissible errors and required bit quantity required for the quantization from below-mentioned Huffman encoding part 35 is less than allowable bit quantity, they are the bit quantity / error amount control section which determines a scale factor.

[0008]In the repetitive loop processing part 3 of drawing 15, 33 based on the scale factor from bit quantity / error amount control section 32, The normalization processing part which normalizes the MDCT frequency spectrum from the MDCT treating part 2, The MDCT frequency spectrum by which Huffman encoding was carried out by the quantizing part which 34 quantizes the normalized MDCT frequency spectrum and carries out inverse quantization, and 35 carrying out Huffman encoding of the quantized MDCT frequency spectrum, The Huffman coding book number selected on the occasion of Huffman encoding is outputted, and it is a Huffman encoding part which calculates the required bit quantity which is needed for quantization, and is outputted.

[0009]Next, operation is explained. FFT computation is performed in FFT operation part 11, it is changed into the signal on a frequency axis from the signal on a time-axis, FFT frequency spectrum is generated, and the input signal inputted into the psychoacoustic model part 1 is outputted to the block type discrimination section 12.

[0010]A processing block type is explained before explanation of the block type discrimination section 12. When changing the signal on a time-axis into the signal on a frequency axis, Two kinds of processing block types, the long type which lengthens in time the signal made into the analysis object in a coding frame, and raises frequency resolution, and the short type which shortens in time the signal made into the analysis object in a coding frame, and raises time resolution, exist. The former is used when only a steady signal exists, and the latter is used when a rapid signal change occurs.

[0011]In the MPEG-2 AAC system, generating of the unpleasant noise called the preecho which originates in shortage of time resolution and is generated is prevented by using two kinds of these processing block types properly according to the characteristic of a signal. In order to always make the processing frame length of coding immobilization, when the object sample of processing is little short type, it has the composition of performing multiple-times part repetition processing. If an example is given, in a long type case, one processing is performed to the object measurement size 1024 of processing, and in a short type case, eight processings will be performed to the object measurement size 128 of processing, changing a sample.

[0012]The block type discrimination section 12 computes a masking threshold, distinguishes a block type from the FFT frequency spectrum from FFT operation part 11 based on the computed masking threshold, and outputs the processing block type which is the result to the MDCT treating part 2 and the multiplexing part 4.

[0013]The SMR operation part 13 Next, the FFT frequency spectrum from FFT operation part 11, Based on the masking threshold which the block type discrimination section 12 computed, the signal which computed and computed signal versus mask ratio SMR versus mask ratio SMR is outputted to the amount calculation

part 31 of permissible errors in the repetitive loop processing part 3.
[0014]Based on the processing block type received from the block type discrimination section 12, the MDCT treating part 2, A conversion process, i.e., frequency orthogonal-transformation processing, is performed from a time-axis to a frequency axis to an input signal, and the MDCT frequency spectrum generated as the result is outputted to the amount calculation part 31 of permissible errors and the normalization processing part 33 in the repetitive loop processing part 3.
[0015]The amount calculation part 31 of permissible errors in the repetitive loop processing part 3 performs the multiplication of the reciprocal (1/SMR) of the signal versus mask ratio SMR from the MDCT frequency spectrum and the SMR operation part 13 from the MDCT treating part 2, and calculates the permissible amount of permissible errors.
[0016]The amount of permissible errors computed in the amount calculation part 31 of permissible errors is outputted to bit quantity / error amount control section 32, and is used as an index at the time of judging quantization error quantity. A noise does not need to be perceived by human being's ear when quantization error quantity is smaller than this amount of permissible errors.
[0017]The normalization processing part 33 normalizes the MDCT frequency spectrum outputted from the MDCT treating part 2 using the scale factor selected in bit quantity / error amount control section 32.
[0018]The quantizing part 34 quantizes the MDCT frequency spectrum normalized by the normalization processing part 33, and outputs the result to Huffman encoding part 35. In order to compute quantization error quantity, inverse quantization is performed, and an inverse quantization value is outputted to bit quantity / error amount control section 32.
[0019]Output the required bit quantity which Huffman encoding part 35 carried out Huffman encoding of the quantized MDCT frequency spectrum, and is needed for quantization to bit quantity / error amount control section 32, and. The MDCT frequency spectrum by which Huffman encoding was carried out, and the Huffman coding book number selected on the occasion of Huffman encoding are outputted to the multiplexing part 4.
[0020]Bit quantity / error amount control section 32 calculates difference with the inverse quantization value of the MDCT frequency spectrum from the MDCT treating part 2, and the MDCT frequency spectrum obtained from the quantizing part 34, i.e., the quantization error quantity by quantization, and performs comparison with the amount of permissible errors computed by the amount calculation part 31 of permissible errors. As a result, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being larger than the amount of permissible errors, the value of a scale factor is made small, and the value of the scale factor is outputted to the normalization processing part 33.
[0021]On the other hand, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being smaller than the amount of permissible errors, comparison with the required bit quantity which is needed for the quantization obtained from Huffman encoding part 35, and allowable bit quantity is performed. This allowable bit quantity subtracts bit quantity required in order that the multiplexing part 4 may add supplementary information, such as a header, from the average bit allotment computed from the bit rate specified in the case of coding. Since supplementary information, such as a scale factor, becomes required 8 batches when a processing block type is a short type and bit quantity required in order to add supplementary information inevitably increases, the allowable bit quantity which can be used for quantization decreases.
[0022]As a result of comparison of required bit quantity and allowable bit quantity, when it judges with the required bit quantity of bit quantity / error amount control section 32 obtained from Huffman encoding part 35 being larger than allowable bit quantity, the value of a scale factor is enlarged to some extent, and the value of the scale factor is outputted to the normalization processing part 33. On the other hand, when it judges with the required bit quantity obtained from Huffman encoding part 35 being smaller than allowable bit quantity, the processing in the repetitive loop processing part 3 is ended, and it shifts to the multiplexing

processing by the multiplexing part 4.
[0023]The repetitive loop processing part 3 until the required bit quantity which the quantization error quantity by the actually quantized MDCT frequency spectrum was less than the amount of permissible errors, and is needed for quantization is less than allowable bit quantity, Repeat execution of the repetitive operation by the normalization processing part 33, the quantizing part 34, and Huffman encoding part 35 is carried out.
[0024]Next, the MDCT frequency spectrum by which the multiplexing part 4 was quantized and Huffman encoding was carried out, The selected Huffman coding book number, the determined scale factor, and the determined processing block type, Multiplexing processing is carried out with supplementary information, such as a header, when the required bit quantity which is needed for quantization is less than allowable bit quantity, after inserting "0" data for the amount of accumulation bit release, an encoded bit sequence is generated, and a coding stream is sent out to a transmission line.
[0025]This amount of accumulation bit release is an insertion amount of "0" data inserted in order to adjust encoded bit queue length and to maintain the bit rate at average value so that the buffer by the side of decoding which receives and accumulates two or more coding streams may not cause underflow.
It is inserted so that it may become the bit quantity assigned on the average at the time of one processing of a coding frame.
For example, the assigned bit quantity at the time of one processing of a coding frame at 3000 bits. When the sum total of bit quantity required in order to add the required bit quantity and supplementary information which are needed for quantization is 2000 bits, insertion of "0" data for the amount of accumulation bit release of 1000 bits is performed.
[0026]
[Problem to be solved by the invention]Since conventional audible signal coding equipment is constituted as mentioned above, when the shot type which shortens in time the signal made into an analysis object, and raises time resolution is used, Since the necessity of including two or more quantization information of a batch in an encoded bit sequence with supplementary information, such as a scale factor, occurred, when especially the bit rate was low, it originated in shortage of the bit quantity assigned to quantization and quantization distortion increased, SUBJECT that tone quality degradation occurred occurred.
[0027]Although changing the bit quantity assigned to quantization as a management proposal of the above-mentioned case was also considered, SUBJECT that it was difficult to decide correctly occurred [how it actually controls and].
[0028]When choosing the short type which was made in order that this invention might solve above SUBJECT, shortens in time the signal made into the analysis object in a coding frame, and raises time resolution, By increasing the bit quantity assigned to quantization, the quantization distortion resulting from shortage of the bit quantity assigned to quantization is controlled, and it aims at obtaining the audible signal coding equipment which can raise tone quality.
[0029]At the time of processing of a coding frame, it aims at obtaining the audible signal coding equipment which can maintain the bit rate at average value by controlling the amount of accumulation bit release efficiently.
[0030]
[Means for solving problem]When the processing block type of the coding frame in an audible signal is a short type which raises time resolution, the audible signal coding equipment concerning this invention, The average bit allotment computed from the bit rate which determines the increase bit quantity for using it for quantization, and is specified as the determined increase bit quantity in the case of coding is added, and the allowable bit quantity which can be used for quantization is calculated.
[0031]The audible signal coding equipment concerning this invention determines increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short

type.
[0032]The audible signal coding equipment concerning this invention makes increase bit quantity the predetermined bit quantity defined beforehand.
[0033]The audible signal coding equipment concerning this invention decreases the increase bit quantity to determine gradually to the coding frame of the predetermined number after the coding frame whose processing block type is a short type.
[0034]A processing block type makes the audible signal coding equipment concerning this invention the predetermined bit quantity which defined beforehand the increase bit quantity of the coding frame which is a short type, The increase bit quantity to determine is gradually decreased to the coding frame of predetermined numbers other than the short type after the coding frame whose processing block type is a short type.
[0035]The audible signal coding equipment concerning this invention adjusts increase bit quantity according to the energy of the audible signal in a coding frame.
[0036]The audible signal coding equipment concerning this invention adjusts increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type.
[0037]The average bit allotment computed from the bit rate by which the audible signal coding equipment concerning this invention is specified in the case of coding, Difference with the operating bit quantity which is needed at the time of processing of a coding frame is accumulated, at the time of processing of subsequent coding frames, predetermined bit quantity is released according to the bit quantity accumulated, and an encoded bit sequence is generated.
[0038]The audible signal coding equipment concerning this invention releases the bit quantity in which the processing block type is accumulated to the coding frame which is except a short type.
[0039]
[Mode for carrying out the invention]Hereafter, one form of implementation of this invention is explained. Embodiment 1. drawing 1 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 1. In a figure, 5 is an increase bit quantity deciding part which controls the increase bit quantity used for quantization based on the processing block type from the block type discrimination section 12 in the psychoacoustic model 1.
[0040]In drawing 1, 6 computes the allowable bit quantity which adds the average bit allotment computed from the bit rate specified in the case of the increase bit quantity from the increase bit quantity deciding part 5, and coding, and can be used for the present coding frame, and outputs it to bit quantity / error amount control section 32, and. It asks for the difference of the operating bit quantity and the average bit allotment which are needed at the time of processing of the last coding frame obtained from the multiplexing part 4, When addition with the bit quantity accumulated until now is performed and the value exceeds predetermined upper limit, it is a bit control part outputted to the multiplexing part 4 by making predetermined bit quantity into the amount of accumulation bit release, and other composition is equivalent to the composition shown in conventional drawing 15.
[0041]Drawing 2 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5 which controls increase bit quantity. In a figure, the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1 50 in a short type. The judgment part which judges or other than this, the switch control section in which 51 controls the switch 53 by the decided result of the judgment part 50, the predetermined fixed bit quantity which defined 52 beforehand, and 53 are switches controlled by the switch control section 51.
[0042]Drawing 3 outputs allowable bit quantity, and it is a block diagram showing the internal configuration of the bit control part 6 which outputs the amount of accumulation bit release for carrying out the good abnormal-conditions paragraph of the encoded bit queue length. The average bit allotment computed in a

figure from the bit rate as which 61 is specified in the case of coding, 62 is an adder unit which adds the increase bit quantity and the average bit allotment 61 from the increase bit quantity deciding part 5, and is outputted to the bit quantity / error amount control section 32 in the repetitive loop processing part 3 as allowable bit quantity.

[0043]The subtraction part which asks for the difference of the operating bit quantity and the average bit allotment 61 for which 63 is needed at the time of processing of the last coding frame of the multiplexing part 4 in drawing 3, 64 is a bit accumulating part outputted to the multiplexing part 4 by making predetermined bit quantity into the amount of accumulation bit release, when not judged and settled [whether the value is settled in predetermined upper limit by performing addition with the difference from the subtraction part 63, and the bit quantity accumulated until now, and].

[0044]Next, operation is explained. Operation of the amount calculation part 31 of permissible errors in the psychoacoustic model part 1, the MDCT treating part 2, and the repetitive loop processing part 3 which are shown in drawing 1, the normalization processing part 33, the quantizing part 34, and Huffman encoding part 35 is the same as usual.

[0045]Next, operation of the increase bit quantity deciding part 5 shown in drawing 2 is explained. Other than this, as for the judgment part 50, the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1 judges or in a short type. When a processing block type is a short type, the judgment part 50 outputs [performing control to which bit quantity is made to increase to the switch control section 51, and] directions. The fixed bit quantity 52 changes the switch 53 to the side connected, and the switch control section 51 which received these directions outputs it to the bit control part 6 by making into increase bit quantity the fixed bit quantity 52 defined beforehand, for example, 200 bits.

[0046]On the other hand, when a processing block type is except a short type, the judgment part 50 outputs [performing control to which bit quantity is not made to increase to the switch control section 51, and] directions. The switch control section 51 which received these directions is changed to the side to which no switches 53 are connected, and is sent out to the bit control part 6 by making bit quantity nothing, i.e., 0 bit, into increase bit quantity.

[0047]Next, operation of the bit control part 6 shown in drawing 3 is explained. The average bit allotment 61 computed from the bit rate as which the adder unit 62 is specified in the case of coding, The increase bit quantity obtained from the increase bit quantity deciding part 5 is added, and it outputs to the bit quantity / error amount control section 32 in the repetitive loop processing part 3 as allowable bit quantity which can be used for quantization of the present coding frame.

[0048]Input the sum total of bit quantity required in order that the subtraction part 63 may add the operating bit quantity which is needed from the multiplexing part 4 at the time of processing of the last coding frame, i.e., the required bit quantity which is needed for quantization, and supplementary information, and This operating bit quantity, It calculates, difference, i.e., a surplus bit, with the average bit allotment 61 computed from the bit rate specified in the case of coding, and outputs to the bit accumulating part 64.

[0049]The bit accumulating part 64 performs addition with the surplus bit from the subtraction part 63, and the surplus bit quantity accumulated at the time of processing of an old coding frame, and judges whether the value is settled in the upper limit defined beforehand, for example, 3000 bits. When not having fitted in this upper limit as a result of the judgment, the bit accumulating part 64 judges that it is [store / too much / a bit], and is outputted to the multiplexing part 4 by making into the amount of accumulation bit release the predetermined bit quantity defined beforehand, for example, 300 bits. In MDCT frequency spectrum, the signal which makes the case exceeding this upper limit the object in a coding frame happens to the case of the uncorresponded item almost near 0 and the signal which a frequency component concentrates on some zones, for example, a sine wave signal. When having fitted in upper limit, the bit accumulating part 64 makes the amount of accumulation bit release 0 bit, and outputs it to the multiplexing part 4.

[0050]The bit quantity / error amount control section 32 in the repetitive loop processing part 3 shown in

drawing 1, Difference with the inverse quantization value of the MDCT frequency spectrum which was obtained from the MDCT frequency spectrum and the quantizing part 34 from the MDCT treating part 2 as usual and by which inverse quantization was quantized and carried out, That is, the quantization error quantity by quantization is calculated and comparison with the amount of permissible errors computed in the amount calculation part 31 of permissible errors is performed. As a result, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being larger than the amount of permissible errors, the value of a scale factor is made small, and the value is outputted to the normalization processing part 33.

[0051]On the other hand, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being smaller than the amount of permissible errors, comparison with the required bit quantity which is needed for the quantization obtained from Huffman encoding part 35, and the allowable bit quantity specified by the bit control part 6 is performed. As a result, when it judges with the required bit quantity of bit quantity / error amount control section 32 being larger than allowable bit quantity, The value of the scale factor outputted to the normalization processing part 33 is enlarged to some extent, and when it judges with the required bit quantity being smaller than allowable bit quantity, the processing in the repetitive loop processing part 3 is ended, and it shifts to the multiplexing processing by the multiplexing part 4.

[0052]The repetitive loop processing part 3 until the required bit quantity which the quantization error quantity by the MDCT frequency spectrum actually quantized as usual was less than the amount of permissible errors, and is needed for quantization is less than allowable bit quantity, Repeat execution of the repetitive operation by the normalization processing part 33, the quantizing part 34, and Huffman encoding part 35 is carried out.

[0053]Thus, in a short type coding frame, by making the allowable bit quantity used for quantization increase, the increase in the quantization distortion by shortage of the amount of quantized bits can be controlled, and tone quality can be raised.

[0054]Next, the MDCT frequency spectrum by which the multiplexing part 4 was quantized and Huffman encoding was carried out, The selected Huffman coding book number, the determined scale factor, and the determined processing block type, Multiplexing processing is carried out with supplementary information, such as a header, after inserting "0" data for the amount of accumulation bit release outputted from the bit control part 6, an encoded bit sequence is generated, and a coding stream is sent out to a transmission line. The multiplexing part 4 totals bit quantity required in order to add the bit quantity which is needed for processing of a coding frame, i.e., the required bit quantity which is needed for quantization, and supplementary information, and outputs it to the bit control part 6 as operating bit quantity.

[0055]Thus, by opening an accumulation bit wide according to the storage states of the bit accumulating part 64, and generating an encoded bit sequence, the bit rate can be maintained at average value and the underflow of the buffer by the side of decoding can be prevented.

[0056]Although the bit control part 6 shown in drawing 3 is used in this embodiment, it may transpose to the bit control part 6a shown in drawing 4. The increase judgment part the increase bit quantity which 65 obtained from the increase bit quantity deciding part 5 judges or other than this in 0 in a figure to be, Judge whether 66 is settled in upper limit predetermined in the value by performing addition with the surplus bit from the subtraction part 63, and the surplus bit quantity accumulated until now, and by the case where it is not settled. And when the increase bit quantity by the decided result of the increase judgment part 65 is 0, it is a bit accumulating part outputted to the multiplexing part 4 by making predetermined bit quantity into the amount of accumulation bit release. Others are equivalent to the composition shown in the bit control part 6 shown in drawing 3.

[0057]Next, operation of the bit control part 6a shown in drawing 4 is explained. Operation of the adder unit 62 and the subtraction part 63 is equivalent to operation of the adder unit 62 shown in drawing 3, and the

subtraction part 63. Other than this, the increase bit quantity obtained from the increase bit quantity deciding part 5 judges or in 0, and the increase judgment part 65 outputs the result to the bit accumulating part 66.
[0058]The bit accumulating part 66 performs addition with the surplus bit from the subtraction part 63, and the surplus bit quantity accumulated until now, and judges whether the value is settled in the upper limit defined beforehand, for example, 3000 bits. When not having fitted in upper limit as a result of this judgment, and when the increase bit quantity by the decided result of the increase judgment part 65 is 0, it judges that it is [store / too much / a bit], and outputs to the multiplexing part 4 by making into the amount of accumulation bit release the bit quantity defined beforehand, for example, 300 bits. In being other, the bit accumulating part 66 makes the amount of accumulation bit release 0 bit, and outputs it to the multiplexing part 4.
[0059]Having judged [whose bit accumulating part 66 is a bit when increase bit quantity is 0] that it is storing [too much] here, In this case, it is because a surplus bit tends to increase, and it is because a surplus bit tends to decrease to have not judged [whose bit accumulating part 66 is a bit when increase bit quantity is not 0] that it is to store [too much]. Thus, even if the added result of the surplus bit from the subtraction part 63 and the surplus bit quantity accumulated until now exceeds the upper limit defined beforehand, when increase bit quantity is not 0. Since the bit quantity accumulated is not released, a surplus bit can be used for addition of the supplementary information in the following coding frame, and storage control of bit quantity can be performed still more efficiently.
[0060]As mentioned above, in the short type coding frame which according to this Embodiment 1 is used in order to raise time resolution, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0061]According to this Embodiment 1, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.
[0062]According to this Embodiment 1, the effect that storage control of the bit quantity can be carried out still more efficiently is acquired by transposing the bit control part 6 to the bit control part 6a.
[0063]Embodiment 2. drawing 5 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 2. In a figure, 5a is an increase bit quantity deciding part which controls the increase bit quantity used for quantization based on the processing block type from the block type discrimination section 12 in the psychoacoustic model 1, and other composition is equivalent to drawing 1 of Embodiment 1.
[0064]Drawing 6 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5a which controls increase bit quantity. In a figure, the processing block type of 50a is a short type and a judgment part which writes a counter value "M-1" in M ** counter 54a when or is judged other than this, a processing block type is a short type and the counter value of M ** counter 54a is "0."
[0065]When the counter value of 54a is "0" in drawing 6, When it directs to perform control to which bit quantity is not made to increase to the switch control section 51a and a counter value is "except zero", At M ** counter which points so that control to which bit quantity is made to increase may be performed to the switch control section 51a, and subtracts "1" from the counter value concerned for every coding frame of a processing object. 51a is a switch control section which controls the switch 53a based on the directions from M ** counter 54a, and that of the fixed bit quantity 52a and the switch 53a is equivalent to the fixed bit quantity 52 and the switch 53 in drawing 2 of Embodiment 1 respectively.
[0066]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5a is the same as that of Embodiment 1. Other than this, as for the judgment part 50a in the increase bit quantity deciding part 5a, the processing block type from the block type discrimination section 12 in the

psychoacoustic model part 1 judges or in a short type.
[0067]When the processing block type of a coding frame is a short type, and when the counter value of M ** counter 54a is "0", the judgment part 50a writes a counter value "M-1" in M ** counter 54a. On the other hand, even if it is a case where a processing block type is a short type, when the counter value of M ** counter 54a is except "0", no judgment parts 50a are carried out.
[0068]Next, M ** counter 54a with which the counter value "M-1" was written in outputs [performing control to which bit quantity is made to increase to the switch control section 51a, and] directions. The fixed bit quantity 52a changes the switch 53a to the side connected, and the switch control section 51a which received these directions outputs it to the bit control part 6 by making into increase bit quantity the fixed bit quantity defined beforehand, for example, 200 bits.
[0069]Even if the processing block type of the following coding frame is a short type, the counter value of M ** counter 54a -- "0" -- since it does not come out, nothing is done, but M ** counter 54a subtracts "1" from the counter value concerned, and the judgment part 50a outputs [performing control which makes bit quantity increase to the switch control section 51a, and] directions. Countdown of this M ** counter 54a is repeated until a counter value is set to 0 for every coding frame, and M ** counter 54a outputs [performing control to which bit quantity is made to increase to the switch control section 51a, and] directions, when a counter value is "except zero."
[0070]On the other hand, when a processing block type is except a short type, no judgment parts 50a are carried out. When the own counter value of M ** counter 54a is then "except zero", Subtract "1" from a counter value for every coding frame, and similarly to the switch control section 51a. Directions are outputted [performing control to which bit quantity is made to increase, and], the fixed bit quantity 52a changes the switch 53a to the side connected, and the switch control section 51a outputs it to the bit control part 6 by making into increase bit quantity the fixed bit quantity defined beforehand, for example, 200 bits.
[0071]And except a short type, a processing block type outputs [that M ** counter 54a performs control to which bit quantity is not made to increase to the switch control section 51a, and] directions, when a counter value is "0." The switch control section 51a which received these directions is changed to the side to which no switches 53a are connected, and is sent out to the bit control part 6 by making bit quantity nothing, i.e., 0 bit, into increase bit quantity.
[0072]As mentioned above, in the short type coding frame which according to this Embodiment 2 is used in order to raise time resolution, and the coding frame for M-1 minute after it, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0073]According to this Embodiment 2, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.
[0074]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 2, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.
[0075]Embodiment 3. drawing 7 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 3. 5b in a figure The FFT frequency spectrum from FFT operation part 11 in the psychoacoustic model part 1, It is an increase bit quantity deciding part which controls increase bit quantity based on the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to the composition shown in drawing 1 of Embodiment 1.
[0076]Drawing 8 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5b which controls increase bit quantity. In a figure, rather than the bit quantity B56b, predetermined bit

quantity A which 55b defined beforehand, and 56b are predetermined bit quantity B defined beforehand, there is much bit quantity, for example, the bit quantity A55b shall be 200 bits, and, as for the bit quantity A55b, it makes bit quantity B56b 100 bits.

[0077]In drawing 8, 57b adds the FFT frequency spectrum of all the zones from FFT operation part 11 in the psychoacoustic model part 1, and it asks for signal energy, The comparing element which controls the switch 58b according to the comparison result comparing with a predetermined threshold the signal energy for which it asked, 58b is a switch controlled by the comparing element 57, and the other judgment parts 50b, the switch control section 51b, and the switch 53b are equivalent to the judgment part 50, the switch control section 51, and the switch 53 which are shown in drawing 2 of Embodiment 1.

[0078]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5b is the same as that of Embodiment 1. Operation of the judgment part 50b in the increase bit quantity deciding part 5b is the same as operation of the judgment part 50 shown in drawing 2 of Embodiment 1, and when a processing block type is a short type, the switch control section 51b is changed to the side to which the switch 53b is connected in the switch 58b.

[0079]The comparing element 57b adds the FFT frequency spectrum of all the zones from FFT operation part 11 in the psychoacoustic model part 1, and it asks for signal energy, When the signal energy for which it asked is judged as signal energy being over a predetermined threshold as compared with a predetermined threshold, The bit quantity A55b with much bit quantity connects the switch 58b to the side connected, and when it judges with signal energy not being over a predetermined threshold, the bit quantity B56b with little bit quantity connects the switch 58b to the side connected.

[0080]Here, the predetermined threshold which the comparing element 57b uses and which was defined beforehand is used for that judgment for which the energy of the signal made into the object of coding processing needs many amounts of quantized bits.

[0081]Thus, when the energy of the signal adding the FFT frequency spectrum of all the zones is over the predetermined threshold by the case where a processing block type is a short type, the bit quantity A55b with much bit quantity is outputted to the bit control part 6 as increase bit quantity. When the energy of the signal adding the FFT frequency spectrum of all the zones is not over the predetermined threshold by the case where a processing block type is a short type, the bit quantity B56b with little bit quantity is outputted to the bit control part 6 as increase bit quantity.

[0082]On the other hand, when a processing block type is except a short type as a result of the judgment of the judgment part 50b, 0 bit is outputted to the bit control part 6 as increase bit quantity like Embodiment 1.

[0083]As mentioned above, in the short type coding frame which according to this Embodiment 3 is used in order to raise time resolution, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.

[0084]According to this Embodiment 3, according to the energy of the signal made into the object in a coding frame, the effect that efficient bit quota control is realizable is acquired by adjusting increase bit quantity.

[0085]According to this Embodiment 3, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.

[0086]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 3, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.

[0087]Embodiment 4. drawing 9 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 4. 5c in a figure The FFT frequency spectrum from FFT

operation part 11 in the psychoacoustic model part 1, It is an increase bit quantity deciding part which controls increase bit quantity based on the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to the composition shown in drawing 1 of Embodiment 1.

[0088]Drawing 10 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5c which controls increase bit quantity. In a figure, the judgment part 50c, M ** counter 54c, and the switch control section 51c, Are equivalent to the judgment part 50a, M ** counter 54a, and the switch control section 51a which are shown in drawing 6 of Embodiment 2, The bit quantity A55c, the bit quantity B56c, the comparing element 57c, the switch 58c, and the switch 53c are equivalent to the bit quantity A55b, the bit quantity B56b, the comparing element 57b, the switch 58b, and the switch 53b which are shown in drawing 8 of Embodiment 3.

[0089]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5c is the same as that of Embodiment 1. Operation of the judgment part 50c in the increase bit quantity deciding part 5c and M ** counter 54c is the same as that of the judgment part 50a and M ** counter 54a which are shown in drawing 6 of Embodiment 2. In the coding frame whose processing block type is a short type, and the coding frame for M-1 minute after it, The switch control section 51c which received [performing control to which bit quantity is made to increase from M ** counter 54c, and] directions is changed to the side to which the switch 53c is connected in the switch 58c.

[0090]The comparing element 57c is made to be the same as that of the comparing element 57b shown in drawing 8 of Embodiment 3, Add the FFT frequency spectrum of all the zones, and the energy of a signal is searched for, When it judges with the energy of a signal being over a predetermined threshold as compared with the predetermined threshold which defined the energy of the signal searched for beforehand, The bit quantity A55c with much bit quantity connects the switch 58c to the side connected, and when it judges with the energy of a signal not being over a predetermined threshold, the bit quantity B56c with little bit quantity connects the switch 58c to the side connected.

[0091]Thus, in a short type coding frame and the coding frame for M-1 minute after it a processing block type, When the energy of the signal adding the FFT frequency spectrum of all the zones is over the predetermined threshold, the bit quantity A55c with much bit quantity is outputted to the bit control part 6 as increase bit quantity. In a short type coding frame and the coding frame for M-1 minute after it a processing block type, When the energy of the signal adding the FFT frequency spectrum of all the zones is not over the predetermined threshold, the bit quantity B56c with little bit quantity is outputted to the bit control part 6 as increase bit quantity.

[0092]On the other hand, except a short type, when the counter value of M ** counter 54c is 0, a processing block type, The switch control section 51c which received [performing control to which bit quantity is not made to increase from M ** counter 54c, and] directions is changed to the side to which no switches 53c are connected, and is outputted to the bit control part 6 by making 0 bit into increase bit quantity.

[0093]As mentioned above, in the short type coding frame which according to this Embodiment 4 is used in order to raise time resolution, and the coding frame for M-1 minute after it, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.

[0094]According to this Embodiment 4, according to the energy of the signal made into the object in a coding frame, the effect that efficient bit quota control is realizable is acquired by adjusting increase bit quantity.

[0095]According to this Embodiment 4, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.

[0096]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 4, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.
[0097]Embodiment 5. drawing 11 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 5. In a figure, 5 d is an increase bit quantity deciding part which controls increase bit quantity based on the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to the composition shown in drawing 1 of Embodiment 1.
[0098]Drawing 12 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5d which controls increase bit quantity. It is a bit quantity controller to which the bit quantity outputted to the switch 53d with the value of M ** counter 54d 59 d is changed in a figure, The other judgment parts 50d, M ** counter 54d, the switch control section 51d, and the switch 53d are equivalent to the judgment part 50a, M ** counter 54a, the switch control section 51a, and the switch 53a which are shown in drawing 6 of Embodiment 2.
[0099]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5d is the same as that of Embodiment 1. Operation of the judgment part 50d in the increase bit quantity deciding part 5d and M ** counter 54d is the same as that of the judgment part 50a and M ** counter 54a which are shown in drawing 6 of Embodiment 2.
[0100]With the value of M ** counter 54d, the bit quantity controller 59d changes the bit quantity outputted to the switch 53d. the time of the value of M ** counter 54d being "M-1" when an example is given -- the time of 200 bits and "M-2" -- 190 bits -- as -- the value of M ** counter 54d -- "1" -- it repeats until it reduces bit quantity 10 bits at a time and the value of M ** counter 54d is set to "0", whenever it decreases. When the value of M ** counter 54d is set to "0", the bit quantity outputted to the switch 53d shall be 0 bit.
[0101]In the coding frame whose processing block type is a short type, and the coding frame for M-1 minute after it, If increase directions of the bit quantity from M ** counter 54d are received, the switch control section 51d, It outputs to the bit control part 6 by making bit quantity which changes with the counter values of M ** counter 54d which the bit quantity controller 59d connected with the side connected, and received the switch 53d from the bit quantity controller 59d into increase bit quantity.
[0102]On the other hand, except a short type, when the counter value of M ** counter 54d is 0, a processing block type, The switch control section 51d which received [performing control to which bit quantity is not made to increase from M ** counter 54d, and] directions is changed to the side to which no switches 53d are connected, and is outputted to the bit control part 6 by making 0 bit into increase bit quantity.
[0103]As mentioned above, in the short type coding frame which according to this Embodiment 5 is used in order to raise time resolution, and the coding frame for M-1 minute after it, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0104]In the coding frame for M-1 minute with which the processing block type changed from the short type to the long type according to this Embodiment 5, From the maximum bit increase of stock when it changes in the short type which influences in tone quality degradation notably, by reducing increase bit quantity gradually. It becomes possible to avoid the tone quality degradation by change of extreme bit quantity, and a processing block type changes and the effect that next tone quality can be raised is acquired.
[0105]According to this Embodiment 5, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.
[0106]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 5, and the effect that storage control of the bit quantity can be carried out still more efficiently

is acquired.
[0107]Embodiment 6. drawing 13 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 6. In a figure, 5e is an increase bit quantity deciding part which controls increase bit quantity based on the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to the composition shown in drawing 1 of Embodiment 1.
[0108]In [drawing 14 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5e which controls increase bit quantity, and] a figure, 59e with the decided result of the processing block type from the judgment part 50e, and the counter value of M ** counter 54e. Are the bit quantity outputted to the switch 53e a bit quantity controller to change, and the other judgment parts 50e, M ** counter 54e, the switch control section 51e, and the switch 53e, It is equivalent to the judgment part 50a, M ** counter 54a, the switch control section 51a, and the switch 53a which are shown in drawing 6 of Embodiment 2.
[0109]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5e is the same as that of Embodiment 1. The judgment part 50e in the increase bit quantity deciding part 5e and M ** counter 54e perform the same processing as the judgment part 50a and M ** counter 54a which are shown in drawing 6 of Embodiment 2.
[0110]When the decided result of the processing block type by the judgment part 50e is a short type, the bit quantity controller 59e outputs predetermined bit quantity, for example, 200 bits, to the switch 53e.
[0111]On the other hand, when the decided result of a processing block type is except a short type, the bit quantity controller 59e changes the bit quantity outputted to the switch 53e with the counter value of M ** counter 54e. When an example is given, and the value of M ** counter 54e is "M-1", like 190 bits at the time of 200 bits and "M-2" the bit quantity controller 59e, the value of M ** counter 54e -- "1" -- it repeats until it reduces 10 bits at a time and the value of M ** counter 54e is set to "0", whenever it decreases. When the value of M ** counter 54e is set to "0", the bit quantity controller 59e makes 0 bit bit quantity outputted to the switch 53e.
[0112]If the switch control section 51e receives increase directions of the bit quantity from M ** counter 54e when a processing block type is a short type, It connects with the side to which the switch 53e is connected in the bit quantity controller 59e, and outputs to the bit control part 6 by making into increase bit quantity the predetermined bit quantity received from the bit quantity controller 59e, for example, 200 bits.
[0113]a processing block type in the coding frame for M-1 minute after a short type with coding frames other than a short type, If increase directions of the bit quantity from M ** counter 54e are received, the switch control section 51e, The bit quantity which changes with the counter values of M ** counter 54e which the bit quantity controller 59e connected the switch 53e to the side connected, and was received from the bit quantity controller 59e is outputted to the bit control part 6 as increase bit quantity.
[0114]On the other hand, except a short type, when the counter value of M ** counter 54e is set to 0, a processing block type, The switch control section 51e which received [performing control to which bit quantity is not made to increase from M ** counter 54e, and] directions is changed to the side to which no switches 53e are connected, and is outputted to the bit control part 6 by making 0 bit into increase bit quantity.
[0115]As mentioned above, in the short type coding frame which according to this Embodiment 6 is used in order to raise time resolution, and the coding frame for M-1 minute after it, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0116]In the coding frame for M-1 minute after a processing block type changes from a short type to a long type according to this Embodiment 6, From the maximum bit increase of stock when it changes in the short

type which influences in tone quality degradation notably, by reducing increase bit quantity gradually. It becomes possible to avoid the tone quality degradation by change of extreme bit quantity, and a processing block type changes and the effect that next tone quality can be raised is acquired.
[0117]While decreasing bit quantity to the coding frame for M-1 minute according to this Embodiment 6, Since it becomes possible to increase increase bit quantity temporarily even when a processing block type changes to a short type, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0118]According to this Embodiment 6, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.
[0119]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 6, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.
[0120]
[Effect of the Invention]As mentioned above, when the processing block type of the coding frame in an audible signal is a short type which raises time resolution according to this invention, By adding the average bit allotment computed from the bit rate which determines the increase bit quantity for using it for quantization, and is specified as the determined increase bit quantity in the case of coding, and calculating the allowable bit quantity which can be used for quantization, The increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0121]By determining increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type according to this invention, Also in the coding frame of the predetermined number after a short type coding frame, the increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0122]According to this invention, it is effective in the ability to calculate easily the increase bit quantity which controls the increase in quantization distortion by making increase bit quantity into the predetermined bit quantity defined beforehand.
[0123]By decreasing the increase bit quantity to determine gradually to the coding frame of the predetermined number after the coding frame whose processing block type is a short type according to this invention, In the coding frame of the predetermined number which changed from the short type to the long type, a processing block type becomes possible [avoiding the tone quality degradation by change of extreme bit quantity], and a processing block type changes and it is effective in the ability to raise next tone quality.
[0124]According to this invention, a processing block type makes increase bit quantity of the coding frame which is a short type the predetermined bit quantity defined beforehand, By decreasing the increase bit quantity to determine gradually to the coding frame of predetermined numbers other than the short type after the coding frame whose processing block type is a short type, In the coding frame of the predetermined number after a processing block type changes from a short type to a long type, It can become possible to avoid the tone quality degradation by change of extreme bit quantity, and a processing block type can change, and can raise next tone quality, and. While decreasing bit quantity to the coding frame of a predetermined number, Since it becomes possible to increase increase bit quantity temporarily even when a processing block type changes to a short type, the increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0125]According to this invention, according to the energy of the audible signal in a coding frame, it is effective in efficient bit quota control being realizable by adjusting increase bit quantity.

[0126]By adjusting increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type according to this invention, In the coding frame of the predetermined number after a short type coding frame, the increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0127]The average bit allotment which is computed from the bit rate specified in the case of coding according to this invention, By accumulating difference with the operating bit quantity which is needed at the time of processing of a coding frame, releasing predetermined bit quantity according to the bit quantity accumulated at the time of processing of subsequent coding frames, and generating an encoded bit sequence, The bit rate can be maintained at average value and it is effective in the ability to prevent the underflow of the buffer by the side of decoding.
[0128]According to this invention, when a processing block type releases the bit quantity accumulated to the coding frame which is except a short type, it is effective in the ability to carry out storage control of the bit quantity still more efficiently.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention]This invention codes the audible signal of a broadband and relates to the audible signal coding equipment which makes variable encoded bit queue length generated by coding processing, and carries out multiplex transmission to a transmission line.

[Translation done.]

* NOTICES *

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PRIOR ART

[Description of the Prior Art]Drawing 15 is a block diagram showing the composition of the conventional audible signal coding equipment of the MPEG-2AAC system shown in 13818 to ISO/IEC7 standard. In a figure, 1 generates FFT (Fast Fourier Transform: Fast Fourier Transform) frequency spectrum from an input signal, and computes a masking threshold, It is a psychoacoustic model part which distinguishes the processing block type of the signal made into an analysis object, and computes the signal versus mask ratio SMR (Signal MaskRatio) with FFT frequency spectrum and a masking threshold. In a certain frequency band, since the mask of the masking threshold is carried out [sound] by the signal component of the characteristic of human being's ear, or other frequency bands, it shows the minimum level value of the signal it becomes impossible to perceive with human being's ear.
[0003]In drawing 15, 2 is a MDCT treating part which carries out the frequency orthogonal transformation of the input signal based on the processing block type from the psychoacoustic model part 1, and generates MDCT (Modified Discrete Cosine Transform: modification discrete cosine transform) frequency spectrum.
[0004]In drawing 15, 3 calculates the amount of permissible errors of quantization permissible with the MDCT frequency spectrum from the signal versus mask ratio SMR and the MDCT treating part 2 from the psychoacoustic model part 1, The processing which normalizes the MDCT frequency spectrum from the MDCT treating part 2, is quantized, and carries out Huffman encoding, The quantization error quantity by the quantized MDCT frequency spectrum is less than the amount of permissible errors, And it carries out repeatedly until the required bit quantity which is needed for quantization is less than allowable bit quantity, It is a repetitive loop processing part which outputs the Huffman coding book number selected on the occasion of the MDCT frequency spectrum and Huffman encoding by which determined the scale factor which is a normalization coefficient and Huffman encoding was carried out to the determined scale factor.
[0005]The MDCT frequency spectrum, Huffman coding book number, and scale factor to which Huffman encoding of 4 was carried out from the repetitive loop processing part 3 in drawing 15, It is a multiplexing part which carries out multiplexing processing of the processing block type from the psychoacoustic model part 1 with supplementary information, such as a header, generates an encoded bit sequence, and sends out encoded bit streams.
[0006]In the psychoacoustic model part 1 of drawing 15, the FFT operation part in which 11 generates FFT frequency spectrum from an input signal, and 12 compute a masking threshold from frequency spectrum, The block type discrimination section which distinguishes the processing block type of the signal made into an analysis object, and 13 are SMR operation part which computes the signal versus mask ratio SMR with the masking threshold from the frequency spectrum and the block type discrimination section 12 from FFT operation part 11.
[0007]It is the amount calculation part of permissible errors which calculates the amount of permissible errors of the quantization which 31 can permit with the MDCT frequency spectrum from the signal versus mask ratio SMR and the MDCT treating part 2 from the psychoacoustic model part 1 in the repetitive loop

processing part 3 of drawing 15, 32 with the inverse quantization value of the MDCT frequency spectrum from the MDCT treating part 2, and the MDCT frequency spectrum which was obtained from the below-mentioned quantizing part 34 and by which inverse quantization was quantized and carried out. As quantization error quantity is calculated, and quantization error quantity is less than the amount of permissible errors computed by the amount calculation part 31 of permissible errors and required bit quantity required for the quantization from below-mentioned Huffman encoding part 35 is less than allowable bit quantity, they are the bit quantity / error amount control section which determines a scale factor.

[0008]In the repetitive loop processing part 3 of drawing 15, 33 based on the scale factor from bit quantity / error amount control section 32, The normalization processing part which normalizes the MDCT frequency spectrum from the MDCT treating part 2, The MDCT frequency spectrum by which Huffman encoding was carried out by the quantizing part which 34 quantizes the normalized MDCT frequency spectrum and carries out inverse quantization, and 35 carrying out Huffman encoding of the quantized MDCT frequency spectrum, The Huffman coding book number selected on the occasion of Huffman encoding is outputted, and it is a Huffman encoding part which calculates the required bit quantity which is needed for quantization, and is outputted.

[0009]Next, operation is explained. FFT computation is performed in FFT operation part 11, it is changed into the signal on a frequency axis from the signal on a time-axis, FFT frequency spectrum is generated, and the input signal inputted into the psychoacoustic model part 1 is outputted to the block type discrimination section 12.

[0010]A processing block type is explained before explanation of the block type discrimination section 12. When changing the signal on a time-axis into the signal on a frequency axis, Two kinds of processing block types, the long type which lengthens in time the signal made into the analysis object in a coding frame, and raises frequency resolution, and the short type which shortens in time the signal made into the analysis object in a coding frame, and raises time resolution, exist. The former is used when only a steady signal exists, and the latter is used when a rapid signal change occurs.

[0011]In the MPEG-2 AAC system, generating of the unpleasant noise called the preecho which originates in shortage of time resolution and is generated is prevented by using two kinds of these processing block types properly according to the characteristic of a signal. In order to always make the processing frame length of coding immobilization, when the object sample of processing is little short type, it has the composition of performing multiple-times part repetition processing. If an example is given, in a long type case, one processing is performed to the object measurement size 1024 of processing, and in a short type case, eight processings will be performed to the object measurement size 128 of processing, changing a sample.

[0012]The block type discrimination section 12 computes a masking threshold, distinguishes a block type from the FFT frequency spectrum from FFT operation part 11 based on the computed masking threshold, and outputs the processing block type which is the result to the MDCT treating part 2 and the multiplexing part 4.

[0013]The SMR operation part 13 Next, the FFT frequency spectrum from FFT operation part 11, Based on the masking threshold which the block type discrimination section 12 computed, the signal which computed and computed signal versus mask ratio SMR versus mask ratio SMR is outputted to the amount calculation part 31 of permissible errors in the repetitive loop processing part 3.

[0014]Based on the processing block type received from the block type discrimination section 12, the MDCT treating part 2, A conversion process, i.e., frequency orthogonal-transformation processing, is performed from a time-axis to a frequency axis to an input signal, and the MDCT frequency spectrum generated as the result is outputted to the amount calculation part 31 of permissible errors and the normalization processing part 33 in the repetitive loop processing part 3.

[0015]The amount calculation part 31 of permissible errors in the repetitive loop processing part 3 performs the multiplication of the reciprocal (1/SMR) of the signal versus mask ratio SMR from the MDCT frequency spectrum and the SMR operation part 13 from the MDCT treating part 2, and calculates the permissible amount of permissible errors.
[0016]The amount of permissible errors computed in the amount calculation part 31 of permissible errors is outputted to bit quantity / error amount control section 32, and is used as an index at the time of judging quantization error quantity. A noise does not need to be perceived by human being's ear when quantization error quantity is smaller than this amount of permissible errors.
[0017]The normalization processing part 33 normalizes the MDCT frequency spectrum outputted from the MDCT treating part 2 using the scale factor selected in bit quantity / error amount control section 32.
[0018]The quantizing part 34 quantizes the MDCT frequency spectrum normalized by the normalization processing part 33, and outputs the result to Huffman encoding part 35. In order to compute quantization error quantity, inverse quantization is performed, and an inverse quantization value is outputted to bit quantity / error amount control section 32.
[0019]Output the required bit quantity which Huffman encoding part 35 carried out Huffman encoding of the quantized MDCT frequency spectrum, and is needed for quantization to bit quantity / error amount control section 32, and. The MDCT frequency spectrum by which Huffman encoding was carried out, and the Huffman coding book number selected on the occasion of Huffman encoding are outputted to the multiplexing part 4.
[0020]Bit quantity / error amount control section 32 calculates difference with the inverse quantization value of the MDCT frequency spectrum from the MDCT treating part 2, and the MDCT frequency spectrum obtained from the quantizing part 34, i.e., the quantization error quantity by quantization, and performs comparison with the amount of permissible errors computed by the amount calculation part 31 of permissible errors. As a result, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being larger than the amount of permissible errors, the value of a scale factor is made small, and the value of the scale factor is outputted to the normalization processing part 33.
[0021]On the other hand, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being smaller than the amount of permissible errors, comparison with the required bit quantity which is needed for the quantization obtained from Huffman encoding part 35, and allowable bit quantity is performed. This allowable bit quantity subtracts bit quantity required in order that the multiplexing part 4 may add supplementary information, such as a header, from the average bit allotment computed from the bit rate specified in the case of coding. Since supplementary information, such as a scale factor, becomes required 8 batches when a processing block type is a short type and bit quantity required in order to add supplementary information inevitably increases, the allowable bit quantity which can be used for quantization decreases.
[0022]As a result of comparison of required bit quantity and allowable bit quantity, when it judges with the required bit quantity of bit quantity / error amount control section 32 obtained from Huffman encoding part 35 being larger than allowable bit quantity, the value of a scale factor is enlarged to some extent, and the value of the scale factor is outputted to the normalization processing part 33. On the other hand, when it judges with the required bit quantity obtained from Huffman encoding part 35 being smaller than allowable bit quantity, the processing in the repetitive loop processing part 3 is ended, and it shifts to the multiplexing processing by the multiplexing part 4.
[0023]The repetitive loop processing part 3 until the required bit quantity which the quantization error quantity by the actually quantized MDCT frequency spectrum was less than the amount of permissible errors, and is needed for quantization is less than allowable bit quantity, Repeat execution of the repetitive operation by the normalization processing part 33, the quantizing part 34, and Huffman encoding part 35 is carried out.

[0024]Next, the MDCT frequency spectrum by which the multiplexing part 4 was quantized and Huffman encoding was carried out, The selected Huffman coding book number, the determined scale factor, and the determined processing block type, Multiplexing processing is carried out with supplementary information, such as a header, when the required bit quantity which is needed for quantization is less than allowable bit quantity, after inserting "0" data for the amount of accumulation bit release, an encoded bit sequence is generated, and a coding stream is sent out to a transmission line.

[0025]This amount of accumulation bit release is an insertion amount of "0" data inserted in order to adjust encoded bit queue length and to maintain the bit rate at average value so that the buffer by the side of decoding which receives and accumulates two or more coding streams may not cause underflow.

It is inserted so that it may become the bit quantity assigned on the average at the time of one processing of a coding frame.

For example, the assigned bit quantity at the time of one processing of a coding frame at 3000 bits. When the sum total of bit quantity required in order to add the required bit quantity and supplementary information which are needed for quantization is 2000 bits, insertion of "0" data for the amount of accumulation bit release of 1000 bits is performed.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, when the processing block type of the coding frame in an audible signal is a short type which raises time resolution according to this invention, By adding the average bit allotment computed from the bit rate which determines the increase bit quantity for using it for quantization, and is specified as the determined increase bit quantity in the case of coding, and calculating the allowable bit quantity which can be used for quantization, The increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0121]By determining increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type according to this invention, Also in the coding frame of the predetermined number after a short type coding frame, the increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0122]According to this invention, it is effective in the ability to calculate easily the increase bit quantity which controls the increase in quantization distortion by making increase bit quantity into the predetermined bit quantity defined beforehand.
[0123]By decreasing the increase bit quantity to determine gradually to the coding frame of the predetermined number after the coding frame whose processing block type is a short type according to this invention, In the coding frame of the predetermined number which changed from the short type to the long type, a processing block type becomes possible [avoiding the tone quality degradation by change of extreme bit quantity], and a processing block type changes and it is effective in the ability to raise next tone quality.
[0124]According to this invention, a processing block type makes increase bit quantity of the coding frame which is a short type the predetermined bit quantity defined beforehand, By decreasing the increase bit quantity to determine gradually to the coding frame of predetermined numbers other than the short type after the coding frame whose processing block type is a short type, In the coding frame of the predetermined number after a processing block type changes from a short type to a long type, It can become possible to avoid the tone quality degradation by change of extreme bit quantity, and a processing block type can change, and can raise next tone quality, and. While decreasing bit quantity to the coding frame of a predetermined number, Since it becomes possible to increase increase bit quantity temporarily even when a processing block type changes to a short type, the increase in the quantization distortion by shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0125]According to this invention, according to the energy of the audible signal in a coding frame, it is effective in efficient bit quota control being realizable by adjusting increase bit quantity.
[0126]By adjusting increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type according to this invention, In the coding frame of the predetermined number after a short type coding frame, the increase in the quantization distortion by

shortage of the amount of quantized bits is controlled, and it is effective in the ability to raise tone quality.
[0127]The average bit allotment which is computed from the bit rate specified in the case of coding according to this invention, By accumulating difference with the operating bit quantity which is needed at the time of processing of a coding frame, releasing predetermined bit quantity according to the bit quantity accumulated at the time of processing of subsequent coding frames, and generating an encoded bit sequence, The bit rate can be maintained at average value and it is effective in the ability to prevent the underflow of the buffer by the side of decoding.
[0128]According to this invention, when a processing block type releases the bit quantity accumulated to the coding frame which is except a short type, it is effective in the ability to carry out storage control of the bit quantity still more efficiently.

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem to be solved by the invention]Since conventional audible signal coding equipment is constituted as mentioned above, when a shot type which shortens in time a signal made into an analysis object, and raises time resolution is used, Since the necessity of including two or more quantization information of a batch in an encoded bit sequence with supplementary information, such as a scale factor, occurred, when especially the bit rate was low, it originated in shortage of bit quantity assigned to quantization and quantization distortion increased, SUBJECT that tone quality degradation occurred occurred.
[0027]Although changing bit quantity assigned to quantization as a management proposal of the above-mentioned case was also considered, SUBJECT that it was difficult to decide correctly occurred [how it actually controls and].
[0028]When choosing a short type which was made in order that this invention might solve above SUBJECT, shortens in time a signal made into an analysis object in a coding frame, and raises time resolution, By increasing bit quantity assigned to quantization, quantization distortion resulting from shortage of bit quantity assigned to quantization is controlled, and it aims at obtaining audible signal coding equipment which can raise tone quality.
[0029]At the time of processing of a coding frame, it aims at obtaining audible signal coding equipment which can maintain the bit rate at average value by controlling the amount of accumulation bit release efficiently.

[Translation done.]

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MEANS

[Means for solving problem]When the processing block type of the coding frame in an audible signal is a short type which raises time resolution, the audible signal coding equipment concerning this invention, The average bit allotment computed from the bit rate which determines the increase bit quantity for using it for quantization, and is specified as the determined increase bit quantity in the case of coding is added, and the allowable bit quantity which can be used for quantization is calculated.
[0031]The audible signal coding equipment concerning this invention determines increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type.
[0032]The audible signal coding equipment concerning this invention makes increase bit quantity the predetermined bit quantity defined beforehand.
[0033]The audible signal coding equipment concerning this invention decreases the increase bit quantity to determine gradually to the coding frame of the predetermined number after the coding frame whose processing block type is a short type.
[0034]A processing block type makes the audible signal coding equipment concerning this invention the predetermined bit quantity which defined beforehand the increase bit quantity of the coding frame which is a short type, The increase bit quantity to determine is gradually decreased to the coding frame of predetermined numbers other than the short type after the coding frame whose processing block type is a short type.
[0035]The audible signal coding equipment concerning this invention adjusts increase bit quantity according to the energy of the audible signal in a coding frame.
[0036]The audible signal coding equipment concerning this invention adjusts increase bit quantity to the coding frame of the predetermined number after the coding frame whose processing block type is a short type.
[0037]The average bit allotment computed from the bit rate by which the audible signal coding equipment concerning this invention is specified in the case of coding, Difference with the operating bit quantity which is needed at the time of processing of a coding frame is accumulated, at the time of processing of subsequent coding frames, predetermined bit quantity is released according to the bit quantity accumulated, and an encoded bit sequence is generated.
[0038]The audible signal coding equipment concerning this invention releases the bit quantity in which the processing block type is accumulated to the coding frame which is except a short type.
[0039]
[Mode for carrying out the invention]Hereafter, one form of implementation of this invention is explained. Embodiment 1. drawing 1 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 1. In a figure, 5 is an increase bit quantity deciding part which controls the increase bit quantity used for quantization based on the processing block type from the

block type discrimination section 12 in the psychoacoustic model 1.
[0040]In drawing 1, 6 computes allowable bit quantity which adds an average bit allotment computed from the bit rate specified in the case of increase bit quantity from the increase bit quantity deciding part 5, and coding, and can be used for the present coding frame, and outputs it to bit quantity / error amount control section 32, and. It asks for difference of operating bit quantity and an average bit allotment which are needed at the time of processing of the last coding frame obtained from the multiplexing part 4, When addition with bit quantity accumulated until now is performed and the value exceeds predetermined upper limit, it is a bit control part outputted to the multiplexing part 4 by making predetermined bit quantity into the amount of accumulation bit release, and other composition is equivalent to composition shown in conventional drawing 15.
[0041]Drawing 2 is a block diagram showing an internal configuration of the increase bit quantity deciding part 5 which controls increase bit quantity. In a figure, a processing block type from the block type discrimination section 12 in the psychoacoustic model part 1 50 in a short type. A judgment part which judges or other than this, a switch control section in which 51 controls the switch 53 by a decided result of the judgment part 50, predetermined fixed bit quantity which defined 52 beforehand, and 53 are switches controlled by the switch control section 51.
[0042]Drawing 3 outputs allowable bit quantity, and it is a block diagram showing the internal configuration of the bit control part 6 which outputs the amount of accumulation bit release for carrying out the good abnormal-conditions paragraph of the encoded bit queue length. The average bit allotment computed in a figure from the bit rate as which 61 is specified in the case of coding, 62 is an adder unit which adds the increase bit quantity and the average bit allotment 61 from the increase bit quantity deciding part 5, and is outputted to the bit quantity / error amount control section 32 in the repetitive loop processing part 3 as allowable bit quantity.
[0043]The subtraction part which asks for the difference of the operating bit quantity and the average bit allotment 61 for which 63 is needed at the time of processing of the last coding frame of the multiplexing part 4 in drawing 3, 64 is a bit accumulating part outputted to the multiplexing part 4 by making predetermined bit quantity into the amount of accumulation bit release, when not judged and settled [whether the value is settled in predetermined upper limit by performing addition with the difference from the subtraction part 63, and the bit quantity accumulated until now, and].
[0044]Next, operation is explained. Operation of the amount calculation part 31 of permissible errors in the psychoacoustic model part 1, the MDCT treating part 2, and the repetitive loop processing part 3 which are shown in drawing 1, the normalization processing part 33, the quantizing part 34, and Huffman encoding part 35 is the same as usual.
[0045]Next, operation of the increase bit quantity deciding part 5 shown in drawing 2 is explained. Other than this, as for the judgment part 50, a processing block type from the block type discrimination section 12 in the psychoacoustic model part 1 judges or in a short type. When a processing block type is a short type, the judgment part 50 outputs [performing control to which bit quantity is made to increase to the switch control section 51, and] directions. The fixed bit quantity 52 changes the switch 53 to a side connected, and the switch control section 51 which received these directions outputs it to the bit control part 6 by making into increase bit quantity the fixed bit quantity 52 defined beforehand, for example, 200 bits.
[0046]On the other hand, when a processing block type is except a short type, the judgment part 50 outputs [performing control to which bit quantity is not made to increase to the switch control section 51, and] directions. The switch control section 51 which received these directions is changed to the side to which no switches 53 are connected, and is sent out to the bit control part 6 by making bit quantity nothing, i.e., 0 bit, into increase bit quantity.
[0047]Next, operation of the bit control part 6 shown in drawing 3 is explained. The average bit allotment 61 computed from the bit rate as which the adder unit 62 is specified in the case of coding, The increase bit

quantity obtained from the increase bit quantity deciding part 5 is added, and it outputs to the bit quantity / error amount control section 32 in the repetitive loop processing part 3 as allowable bit quantity which can be used for quantization of the present coding frame.

[0048]Input the sum total of bit quantity required in order that the subtraction part 63 may add the operating bit quantity which is needed from the multiplexing part 4 at the time of processing of the last coding frame, i.e., the required bit quantity which is needed for quantization, and supplementary information, and This operating bit quantity, It calculates, difference, i.e., a surplus bit, with the average bit allotment 61 computed from the bit rate specified in the case of coding, and outputs to the bit accumulating part 64.

[0049]The bit accumulating part 64 performs addition with a surplus bit from the subtraction part 63, and surplus bit quantity accumulated at the time of processing of an old coding frame, and judges whether the value is settled in upper limit defined beforehand, for example, 3000 bits. When not having fitted in this upper limit as a result of a judgment, the bit accumulating part 64 judges that it is [store / too much / a bit], and is outputted to the multiplexing part 4 by making into the amount of accumulation bit release predetermined bit quantity defined beforehand, for example, 300 bits. In MDCT frequency spectrum, a signal which makes a case exceeding this upper limit an object in a coding frame happens to a case of an uncorresponded item almost near 0 and a signal which a frequency component concentrates on some zones, for example, a sine wave signal. When having fitted in upper limit, the bit accumulating part 64 makes the amount of accumulation bit release 0 bit, and outputs it to the multiplexing part 4.

[0050]The bit quantity / error amount control section 32 in the repetitive loop processing part 3 shown in drawing 1, Difference with an inverse quantization value of MDCT frequency spectrum which was obtained from MDCT frequency spectrum and the quantizing part 34 from the MDCT treating part 2 as usual and by which inverse quantization was quantized and carried out, That is, quantization error quantity by quantization is calculated and comparison with the amount of permissible errors computed in the amount calculation part 31 of permissible errors is performed. As a result, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being larger than the amount of permissible errors, a value of a scale factor is made small, and the value is outputted to the normalization processing part 33.

[0051]On the other hand, when it judges with the quantization error quantity of bit quantity / error amount control section 32 being smaller than the amount of permissible errors, comparison with the required bit quantity which is needed for the quantization obtained from Huffman encoding part 35, and the allowable bit quantity specified by the bit control part 6 is performed. As a result, when it judges with the required bit quantity of bit quantity / error amount control section 32 being larger than allowable bit quantity, The value of the scale factor outputted to the normalization processing part 33 is enlarged to some extent, and when it judges with the required bit quantity being smaller than allowable bit quantity, the processing in the repetitive loop processing part 3 is ended, and it shifts to the multiplexing processing by the multiplexing part 4.

[0052]The repetitive loop processing part 3 until the required bit quantity which the quantization error quantity by the MDCT frequency spectrum actually quantized as usual was less than the amount of permissible errors, and is needed for quantization is less than allowable bit quantity, Repeat execution of the repetitive operation by the normalization processing part 33, the quantizing part 34, and Huffman encoding part 35 is carried out.

[0053]Thus, in a short type coding frame, by making the allowable bit quantity used for quantization increase, the increase in the quantization distortion by shortage of the amount of quantized bits can be controlled, and tone quality can be raised.

[0054]Next, the MDCT frequency spectrum by which the multiplexing part 4 was quantized and Huffman encoding was carried out, The selected Huffman coding book number, the determined scale factor, and the determined processing block type, Multiplexing processing is carried out with supplementary information, such as a header, after inserting "0" data for the amount of accumulation bit release outputted from the bit

control part 6, an encoded bit sequence is generated, and a coding stream is sent out to a transmission line. The multiplexing part 4 totals bit quantity required in order to add the bit quantity which is needed for processing of a coding frame, i.e., the required bit quantity which is needed for quantization, and supplementary information, and outputs it to the bit control part 6 as operating bit quantity.

[0055]Thus, by opening an accumulation bit wide according to the storage states of the bit accumulating part 64, and generating an encoded bit sequence, the bit rate can be maintained at average value and the underflow of the buffer by the side of decoding can be prevented.

[0056]Although the bit control part 6 shown in drawing 3 is used in this embodiment, it may transpose to the bit control part 6a shown in drawing 4. The increase judgment part the increase bit quantity which 65 obtained from the increase bit quantity deciding part 5 judges or other than this in 0 in a figure to be, Judge whether 66 is settled in upper limit predetermined in the value by performing addition with the surplus bit from the subtraction part 63, and the surplus bit quantity accumulated until now, and by the case where it is not settled. And when the increase bit quantity by the decided result of the increase judgment part 65 is 0, it is a bit accumulating part outputted to the multiplexing part 4 by making predetermined bit quantity into the amount of accumulation bit release. Others are equivalent to the composition shown in the bit control part 6 shown in drawing 3.

[0057]Next, operation of the bit control part 6a shown in drawing 4 is explained. Operation of the adder unit 62 and the subtraction part 63 is equivalent to operation of the adder unit 62 shown in drawing 3, and the subtraction part 63. Other than this, increase bit quantity obtained from the increase bit quantity deciding part 5 judges or in 0, and the increase judgment part 65 outputs the result to the bit accumulating part 66.

[0058]The bit accumulating part 66 performs addition with a surplus bit from the subtraction part 63, and surplus bit quantity accumulated until now, and judges whether the value is settled in upper limit defined beforehand, for example, 3000 bits. When not having fitted in upper limit as a result of this judgment, and when increase bit quantity by a decided result of the increase judgment part 65 is 0, it judges that it is [store / too much / a bit], and outputs to the multiplexing part 4 by making into the amount of accumulation bit release bit quantity defined beforehand, for example, 300 bits. In being other, the bit accumulating part 66 makes the amount of accumulation bit release 0 bit, and outputs it to the multiplexing part 4.

[0059]Having judged [whose bit accumulating part 66 is a bit when increase bit quantity is 0] that it is storing [too much] here, In this case, it is because a surplus bit tends to increase, and it is because a surplus bit tends to decrease to have not judged [whose bit accumulating part 66 is a bit when increase bit quantity is not 0] that it is to store [too much]. Thus, even if the added result of the surplus bit from the subtraction part 63 and the surplus bit quantity accumulated until now exceeds the upper limit defined beforehand, when increase bit quantity is not 0. Since the bit quantity accumulated is not released, a surplus bit can be used for addition of the supplementary information in the following coding frame, and storage control of bit quantity can be performed still more efficiently.

[0060]As mentioned above, in the short type coding frame which according to this Embodiment 1 is used in order to raise time resolution, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.

[0061]According to this Embodiment 1, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.

[0062]According to this Embodiment 1, the effect that storage control of the bit quantity can be carried out still more efficiently is acquired by transposing the bit control part 6 to the bit control part 6a.

[0063]Embodiment 2. drawing 5 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 2. In a figure, 5a is an increase bit quantity deciding part

which controls the increase bit quantity used for quantization based on the processing block type from the block type discrimination section 12 in the psychoacoustic model 1, and other composition is equivalent to drawing 1 of Embodiment 1.

[0064]Drawing 6 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5a which controls increase bit quantity. In a figure, the processing block type of 50a is a short type and a judgment part which writes a counter value "M-1" in M ** counter 54a when or is judged other than this, a processing block type is a short type and the counter value of M ** counter 54a is "0."

[0065]When a counter value of 54a is "0" in drawing 6, When it directs to perform control to which bit quantity is not made to increase to the switch control section 51a and a counter value is "except zero", At M ** counter which points so that control to which bit quantity is made to increase may be performed to the switch control section 51a, and subtracts "1" from the counter value concerned for every coding frame of a processing object. 51a is a switch control section which controls the switch 53a based on directions from M ** counter 54a, and that of the fixed bit quantity 52a and the switch 53a is equivalent to the fixed bit quantity 52 and the switch 53 in drawing 2 of Embodiment 1 respectively.

[0066]Next, operation is explained. Operation of those other than increase bit quantity deciding part 5a is the same as that of Embodiment 1. Other than this, as for the judgment part 50a in the increase bit quantity deciding part 5a, a processing block type from the block type discrimination section 12 in the psychoacoustic model part 1 judges or in a short type.

[0067]When the processing block type of a coding frame is a short type, and when the counter value of M ** counter 54a is "0", the judgment part 50a writes a counter value "M-1" in M ** counter 54a. On the other hand, even if it is a case where a processing block type is a short type, when the counter value of M ** counter 54a is except "0", no judgment parts 50a are carried out.

[0068]Next, M ** counter 54a with which the counter value "M-1" was written in outputs [performing control to which bit quantity is made to increase to the switch control section 51a, and] directions. The fixed bit quantity 52a changes the switch 53a to the side connected, and the switch control section 51a which received these directions outputs it to the bit control part 6 by making into increase bit quantity the fixed bit quantity defined beforehand, for example, 200 bits.

[0069]Even if the processing block type of the following coding frame is a short type, the counter value of M ** counter 54a -- "0" -- since it does not come out, nothing is done, but M ** counter 54a subtracts "1" from the counter value concerned, and the judgment part 50a outputs [performing control which makes bit quantity increase to the switch control section 51a, and] directions. Countdown of this M ** counter 54a is repeated until a counter value is set to 0 for every coding frame, and M ** counter 54a outputs [performing control to which bit quantity is made to increase to the switch control section 51a, and] directions, when a counter value is "except zero."

[0070]On the other hand, when a processing block type is except a short type, no judgment parts 50a are carried out. When an own counter value of M ** counter 54a is then "except zero", Subtract "1" from a counter value for every coding frame, and similarly to the switch control section 51a. Directions are outputted [performing control to which bit quantity is made to increase, and], the fixed bit quantity 52a changes the switch 53a to a side connected, and the switch control section 51a outputs it to the bit control part 6 by making into increase bit quantity fixed bit quantity defined beforehand, for example, 200 bits.

[0071]And except a short type, a processing block type outputs [that M ** counter 54a performs control to which bit quantity is not made to increase to the switch control section 51a, and] directions, when a counter value is "0." The switch control section 51a which received these directions is changed to a side to which no switches 53a are connected, and is sent out to the bit control part 6 by making bit quantity nothing, i.e., 0 bit, into increase bit quantity.

[0072]As mentioned above, in a short type coding frame which according to this Embodiment 2 is used in order to raise time resolution, and a coding frame for M-1 minute after it, It becomes possible to make

allowable bit quantity used for quantization increase easily, an increase in quantization distortion by shortage of the amount of quantized bits resulting from an increase in supplementary information at the time of coding is controlled, and an effect that tone quality can be raised is acquired.

[0073]According to this Embodiment 2, by opening an accumulation bit according to storage states of the bit accumulating part 64, the bit rate can be maintained at average value and an effect that underflow of a buffer by the side of decoding can be prevented is acquired.

[0074]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 2, and an effect that storage control of the bit quantity can be carried out still more efficiently is acquired.

[0075]Embodiment 3. drawing 7 is a block diagram showing composition of audible signal coding equipment by this embodiment of the invention 3. 5b in a figure FFT frequency spectrum from FFT operation part 11 in the psychoacoustic model part 1, It is an increase bit quantity deciding part which controls increase bit quantity based on a processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to composition shown in drawing 1 of Embodiment 1.

[0076]Drawing 8 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5b which controls increase bit quantity. In a figure, rather than the bit quantity B56b, predetermined bit quantity A which 55b defined beforehand, and 56b are predetermined bit quantity B defined beforehand, there is much bit quantity, for example, the bit quantity A55b shall be 200 bits, and, as for the bit quantity A55b, it makes bit quantity B56b 100 bits.

[0077]In drawing 8, 57b adds the FFT frequency spectrum of all the zones from FFT operation part 11 in the psychoacoustic model part 1, and it asks for signal energy, The comparing element which controls the switch 58b according to the comparison result comparing with a predetermined threshold the signal energy for which it asked, 58b is a switch controlled by the comparing element 57, and the other judgment parts 50b, the switch control section 51b, and the switch 53b are equivalent to the judgment part 50, the switch control section 51, and the switch 53 which are shown in drawing 2 of Embodiment 1.

[0078]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5b is the same as that of Embodiment 1. Operation of the judgment part 50b in the increase bit quantity deciding part 5b is the same as operation of the judgment part 50 shown in drawing 2 of Embodiment 1, and when a processing block type is a short type, the switch control section 51b is changed to the side to which the switch 53b is connected in the switch 58b.

[0079]The comparing element 57b adds the FFT frequency spectrum of all the zones from FFT operation part 11 in the psychoacoustic model part 1, and it asks for signal energy, When the signal energy for which it asked is judged as signal energy being over a predetermined threshold as compared with a predetermined threshold, The bit quantity A55b with much bit quantity connects the switch 58b to the side connected, and when it judges with signal energy not being over a predetermined threshold, the bit quantity B56b with little bit quantity connects the switch 58b to the side connected.

[0080]Here, a predetermined threshold which the comparing element 57b uses and which was defined beforehand is used for that judgment for which energy of a signal made into an object of coding processing needs many amounts of quantized bits.

[0081]Thus, when energy of a signal adding FFT frequency spectrum of all the zones is over a predetermined threshold by a case where a processing block type is a short type, the bit quantity A55b with much bit quantity is outputted to the bit control part 6 as increase bit quantity. When energy of a signal adding FFT frequency spectrum of all the zones is not over a predetermined threshold by a case where a processing block type is a short type, the bit quantity B56b with little bit quantity is outputted to the bit control part 6 as increase bit quantity.

[0082]On the other hand, when a processing block type is except a short type as a result of a judgment of

the judgment part 50b, 0 bit is outputted to the bit control part 6 as increase bit quantity like Embodiment 1.
[0083]As mentioned above, in a short type coding frame which according to this Embodiment 3 is used in order to raise time resolution, It becomes possible to make allowable bit quantity used for quantization increase easily, an increase in quantization distortion by shortage of the amount of quantized bits resulting from an increase in supplementary information at the time of coding is controlled, and an effect that tone quality can be raised is acquired.
[0084]According to this Embodiment 3, according to energy of a signal made into an object in a coding frame, an effect that efficient bit quota control is realizable is acquired by adjusting increase bit quantity.
[0085]According to this Embodiment 3, by opening an accumulation bit according to storage states of the bit accumulating part 64, the bit rate can be maintained at average value and an effect that underflow of a buffer by the side of decoding can be prevented is acquired.
[0086]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 3, and an effect that storage control of the bit quantity can be carried out still more efficiently is acquired.
[0087]Embodiment 4. drawing 9 is a block diagram showing composition of audible signal coding equipment by this embodiment of the invention 4. 5c in a figure FFT frequency spectrum from FFT operation part 11 in the psychoacoustic model part 1, It is an increase bit quantity deciding part which controls increase bit quantity based on a processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to composition shown in drawing 1 of Embodiment 1.
[0088]Drawing 10 is a block diagram showing an internal configuration of the increase bit quantity deciding part 5c which controls increase bit quantity. In a figure, the judgment part 50c, M ** counter 54c, and the switch control section 51c, Are equivalent to the judgment part 50a, M ** counter 54a, and the switch control section 51a which are shown in drawing 6 of Embodiment 2, The bit quantity A55c, the bit quantity B56c, the comparing element 57c, the switch 58c, and the switch 53c are equivalent to the bit quantity A55b, the bit quantity B56b, the comparing element 57b, the switch 58b, and the switch 53b which are shown in drawing 8 of Embodiment 3.
[0089]Next, operation is explained. Operation of those other than increase bit quantity deciding part 5c is the same as that of Embodiment 1. Operation of the judgment part 50c in the increase bit quantity deciding part 5c and M ** counter 54c is the same as that of the judgment part 50a and M ** counter 54a which are shown in drawing 6 of Embodiment 2. In a coding frame whose processing block type is a short type, and a coding frame for M-1 minute after it, The switch control section 51c which received [performing control to which bit quantity is made to increase from M ** counter 54c, and] directions is changed to a side to which the switch 53c is connected in the switch 58c.
[0090]The comparing element 57c is made to be the same as that of the comparing element 57b shown in drawing 8 of Embodiment 3, Add FFT frequency spectrum of all the zones, and energy of a signal is searched for, When it judges with energy of a signal being over a predetermined threshold as compared with a predetermined threshold which defined energy of a signal searched for beforehand, The bit quantity A55c with much bit quantity connects the switch 58c to a side connected, and when it judges with energy of a signal not being over a predetermined threshold, the bit quantity B56c with little bit quantity connects the switch 58c to a side connected.
[0091]Thus, in a short type coding frame and the coding frame for M-1 minute after it a processing block type, When the energy of the signal adding the FFT frequency spectrum of all the zones is over the predetermined threshold, the bit quantity A55c with much bit quantity is outputted to the bit control part 6 as increase bit quantity. In a short type coding frame and the coding frame for M-1 minute after it a processing block type, When the energy of the signal adding the FFT frequency spectrum of all the zones is not over the predetermined threshold, the bit quantity B56c with little bit quantity is outputted to the bit control part 6

as increase bit quantity.
[0092]On the other hand, except a short type, when the counter value of M ** counter 54c is 0, a processing block type, The switch control section 51c which received [performing control to which bit quantity is not made to increase from M ** counter 54c, and] directions is changed to the side to which no switches 53c are connected, and is outputted to the bit control part 6 by making 0 bit into increase bit quantity.
[0093]As mentioned above, in the short type coding frame which according to this Embodiment 4 is used in order to raise time resolution, and the coding frame for M-1 minute after it, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0094]According to this Embodiment 4, according to the energy of the signal made into the object in a coding frame, the effect that efficient bit quota control is realizable is acquired by adjusting increase bit quantity.
[0095]According to this Embodiment 4, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.
[0096]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 4, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.
[0097]Embodiment 5. drawing 11 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 5. In a figure, 5 d is an increase bit quantity deciding part which controls increase bit quantity based on the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to the composition shown in drawing 1 of Embodiment 1.
[0098]Drawing 12 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5d which controls increase bit quantity. It is a bit quantity controller to which the bit quantity outputted to the switch 53d with the value of M ** counter 54d 59 d is changed in a figure, The other judgment parts 50d, M ** counter 54d, the switch control section 51d, and the switch 53d are equivalent to the judgment part 50a, M ** counter 54a, the switch control section 51a, and the switch 53a which are shown in drawing 6 of Embodiment 2.
[0099]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5d is the same as that of Embodiment 1. Operation of the judgment part 50d in the increase bit quantity deciding part 5d and M ** counter 54d is the same as that of the judgment part 50a and M ** counter 54a which are shown in drawing 6 of Embodiment 2.
[0100]With the value of M ** counter 54d, the bit quantity controller 59d changes the bit quantity outputted to the switch 53d. the time of the value of M ** counter 54d being "M-1" when an example is given -- the time of 200 bits and "M-2" -- 190 bits -- as -- the value of M ** counter 54d -- "1" -- it repeats until it reduces bit quantity 10 bits at a time and the value of M ** counter 54d is set to "0", whenever it decreases. When the value of M ** counter 54d is set to "0", the bit quantity outputted to the switch 53d shall be 0 bit.
[0101]In the coding frame whose processing block type is a short type, and the coding frame for M-1 minute after it, If increase directions of the bit quantity from M ** counter 54d are received, the switch control section 51d, It outputs to the bit control part 6 by making bit quantity which changes with the counter values of M ** counter 54d which the bit quantity controller 59d connected with the side connected, and received the switch 53d from the bit quantity controller 59d into increase bit quantity.
[0102]On the other hand, except a short type, when the counter value of M ** counter 54d is 0, a processing block type, The switch control section 51d which received [performing control to which bit quantity is not made to increase from M ** counter 54d, and] directions is changed to the side to which no switches 53d

are connected, and is outputted to the bit control part 6 by making 0 bit into increase bit quantity.
[0103]As mentioned above, in the short type coding frame which according to this Embodiment 5 is used in order to raise time resolution, and the coding frame for M-1 minute after it, It becomes possible to make the allowable bit quantity used for quantization increase easily, the increase in the quantization distortion by shortage of the amount of quantized bits resulting from the increase in the supplementary information at the time of coding is controlled, and the effect that tone quality can be raised is acquired.
[0104]In the coding frame for M-1 minute with which the processing block type changed from the short type to the long type according to this Embodiment 5, From the maximum bit increase of stock when it changes in the short type which influences in tone quality degradation notably, by reducing increase bit quantity gradually. It becomes possible to avoid the tone quality degradation by change of extreme bit quantity, and a processing block type changes and the effect that next tone quality can be raised is acquired.
[0105]According to this Embodiment 5, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.
[0106]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 5, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.
[0107]Embodiment 6. drawing 13 is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 6. In a figure, 5e is an increase bit quantity deciding part which controls increase bit quantity based on the processing block type from the block type discrimination section 12 in the psychoacoustic model part 1, and other composition is equivalent to the composition shown in drawing 1 of Embodiment 1.
[0108]In [drawing 14 is a block diagram showing the internal configuration of the increase bit quantity deciding part 5e which controls increase bit quantity, and] a figure, 59e with the decided result of the processing block type from the judgment part 50e, and the counter value of M ** counter 54e. Are the bit quantity outputted to the switch 53e a bit quantity controller to change, and the other judgment parts 50e, M ** counter 54e, the switch control section 51e, and the switch 53e, It is equivalent to the judgment part 50a, M ** counter 54a, the switch control section 51a, and the switch 53a which are shown in drawing 6 of Embodiment 2.
[0109]Next, operation is explained. The operation of those other than increase bit quantity deciding part 5e is the same as that of Embodiment 1. The judgment part 50e in the increase bit quantity deciding part 5e and M ** counter 54e perform the same processing as the judgment part 50a and M ** counter 54a which are shown in drawing 6 of Embodiment 2.
[0110]When the decided result of the processing block type by the judgment part 50e is a short type, the bit quantity controller 59e outputs predetermined bit quantity, for example, 200 bits, to the switch 53e.
[0111]On the other hand, when the decided result of a processing block type is except a short type, the bit quantity controller 59e changes the bit quantity outputted to the switch 53e with the counter value of M ** counter 54e. When an example is given, and the value of M ** counter 54e is "M-1", like 190 bits at the time of 200 bits and "M-2" the bit quantity controller 59e, the value of M ** counter 54e -- "1" -- it repeats until it reduces 10 bits at a time and the value of M ** counter 54e is set to "0", whenever it decreases. When the value of M ** counter 54e is set to "0", the bit quantity controller 59e makes 0 bit bit quantity outputted to the switch 53e.
[0112]If the switch control section 51e receives increase directions of bit quantity from M ** counter 54e when a processing block type is a short type, It connects with a side to which the switch 53e is connected in the bit quantity controller 59e, and outputs to the bit control part 6 by making into increase bit quantity predetermined bit quantity received from the bit quantity controller 59e, for example, 200 bits.
[0113]a processing block type in a coding frame for M-1 minute after a short type with coding frames other

than a short type, If increase directions of bit quantity from M ** counter 54e are received, the switch control section 51e, Bit quantity which changes with the counter values of M ** counter 54e which the bit quantity controller 59e connected the switch 53e to a side connected, and was received from the bit quantity controller 59e is outputted to the bit control part 6 as increase bit quantity.

[0114]On the other hand, except a short type, when a counter value of M ** counter 54e is set to 0, a processing block type, The switch control section 51e which received [performing control to which bit quantity is not made to increase from M ** counter 54e, and] directions is changed to a side to which no switches 53e are connected, and is outputted to the bit control part 6 by making 0 bit into increase bit quantity.

[0115]As mentioned above, in a short type coding frame which according to this Embodiment 6 is used in order to raise time resolution, and a coding frame for M-1 minute after it, It becomes possible to make allowable bit quantity used for quantization increase easily, an increase in quantization distortion by shortage of the amount of quantized bits resulting from an increase in supplementary information at the time of coding is controlled, and an effect that tone quality can be raised is acquired.

[0116]In a coding frame for M-1 minute after a processing block type changes from a short type to a long type according to this Embodiment 6, From the maximum bit increase of stock when it changes in a short type which influences in tone quality degradation notably, by reducing increase bit quantity gradually. It becomes possible to avoid tone quality degradation by change of extreme bit quantity, and a processing block type changes and an effect that next tone quality can be raised is acquired.

[0117]While decreasing bit quantity to a coding frame for M-1 minute according to this Embodiment 6, Since it becomes possible to increase increase bit quantity temporarily even when a processing block type changes to a short type, an increase in quantization distortion by shortage of the amount of quantized bits resulting from an increase in supplementary information at the time of coding is controlled, and an effect that tone quality can be raised is acquired.

[0118]According to this Embodiment 6, by opening an accumulation bit according to the storage states of the bit accumulating part 64, the bit rate can be maintained at average value and the effect that the underflow of the buffer by the side of decoding can be prevented is acquired.

[0119]The bit control part 6 may be transposed to the bit control part 6a shown in drawing 4 also by this Embodiment 6, and the effect that storage control of the bit quantity can be carried out still more efficiently is acquired.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 1.
[Drawing 2]It is a block diagram showing the composition of the increase bit quantity deciding part by this embodiment of the invention 1.
[Drawing 3]It is a block diagram showing the composition of the bit control part by this embodiment of the invention 1.
[Drawing 4]It is a block diagram showing the composition of other bit control parts by this embodiment of the invention 1.
[Drawing 5]It is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 2.
[Drawing 6]It is a block diagram showing the composition of the increase bit quantity deciding part by this embodiment of the invention 2.
[Drawing 7]It is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 3.
[Drawing 8]It is a block diagram showing the composition of the increase bit quantity deciding part by this embodiment of the invention 3.
[Drawing 9]It is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 4.
[Drawing 10]It is a block diagram showing the composition of the increase bit quantity deciding part by this embodiment of the invention 4.
[Drawing 11]It is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 5.
[Drawing 12]It is a block diagram showing the composition of the increase bit quantity deciding part by this embodiment of the invention 5.
[Drawing 13]It is a block diagram showing the composition of the audible signal coding equipment by this embodiment of the invention 6.
[Drawing 14]It is a block diagram showing the composition of the increase bit quantity deciding part by this embodiment of the invention 6.
[Drawing 15]It is a block diagram showing the composition of conventional audible signal coding equipment.
[Explanations of letters or numerals]
1 A psychoacoustic model part, 2 MDCT treating part, and 3 Repetitive loop processing part, 4 A multiplexing part, and 5, 5a, 5b, 5c, 5d and 5e Increase bit quantity deciding part, 6 and 6a bit control part, 11 FFT operation parts, and 12 Block type discrimination section, 13 SMR operation part and 31 The

amount calculation part of permissible errors, 32 bit quantity / error amount control section, 33 A normalization processing part and 34 A quantizing part, 35 Huffman encoding parts, and 50, 50a, 50b, 50c, 50d and 50e Judgment part, 51, 51a, 51b, 51c, 51d, 51e switch control section, 52 52a Fixed bit quantity, and 53, 53a, 53b, 53c, 53d and 53e Switch, 54a, 54c, 54d, 54e M ** counter, 55b, 55c bit quantity A, 56b, 56c bit quantity B, and 57b and 57c A comparing element, and 58b and 58c A switch, 59 d, 59e bit quantity controller, and 61 An average bit allotment and 62 [An adder unit and 63] [A subtraction part and 64] [A bit accumulating part and 65] [An increase judgment part and 66] [Bit accumulating part.]

[Translation done.]

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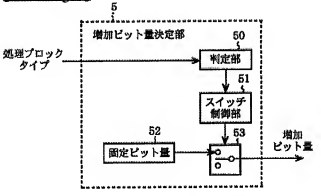
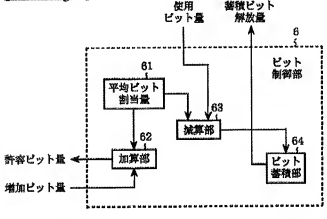
DRAWINGS

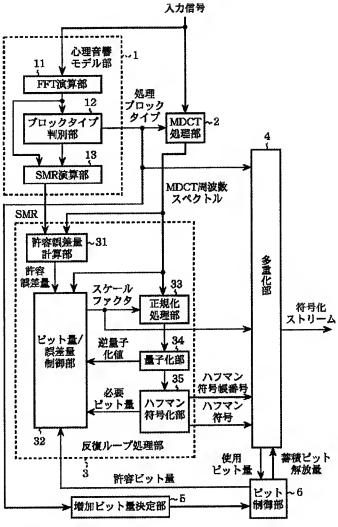
[Drawing 2]



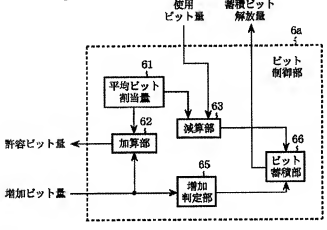
[Drawing 3]



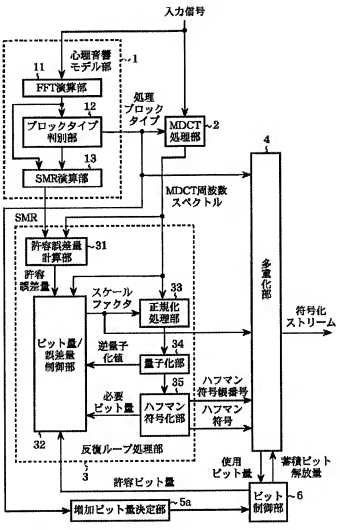
[Drawing 1]



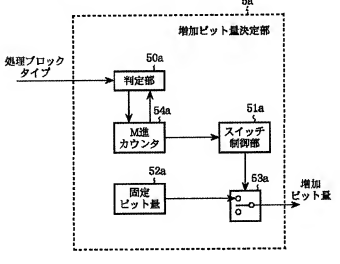
[Drawing 4]



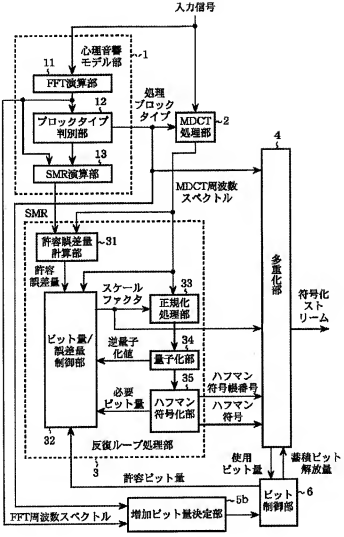
[Drawing 5]



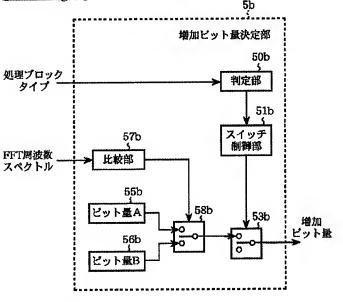
[Drawing 6]



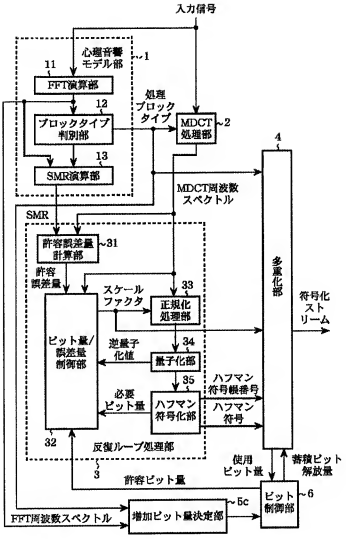
[Drawing 7]



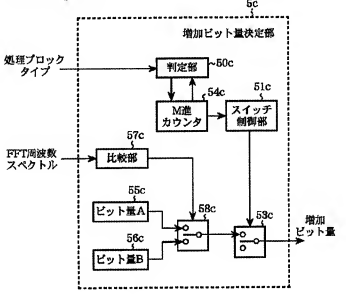
[Drawing 8]



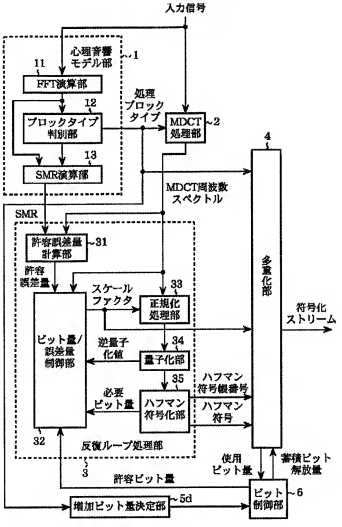
[Drawing 9]



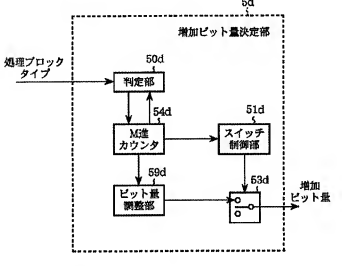
[Drawing 10]



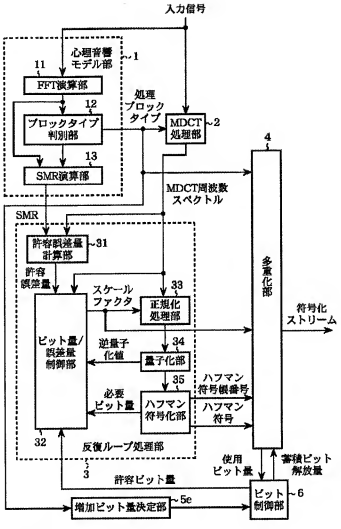
[Drawing 11]



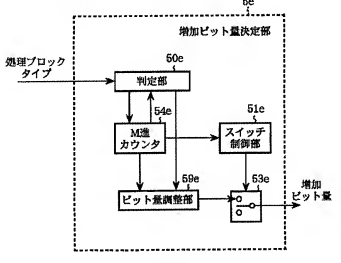
[Drawing 12]



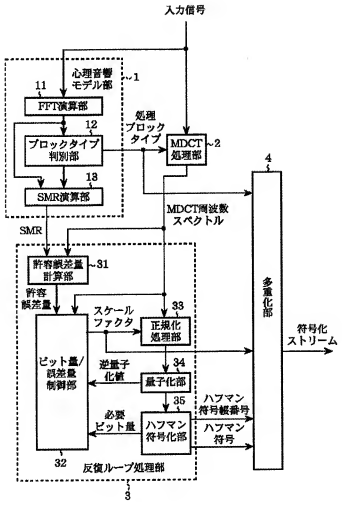
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Translation done.]